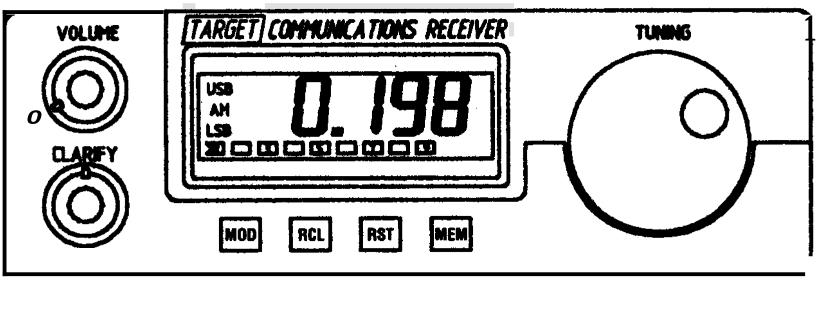
# A GUIDE TO SHORT WAVE LISTENING USING THE TARGET HF3 RECEIVER

BY
ALAN. J. MULLEY

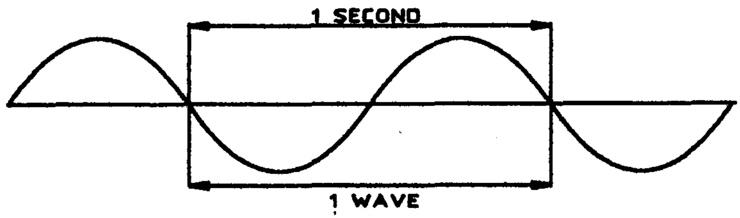


The TARGET HF3 receiver covers the entire spectrum from 30 kHz to **30** MHz.

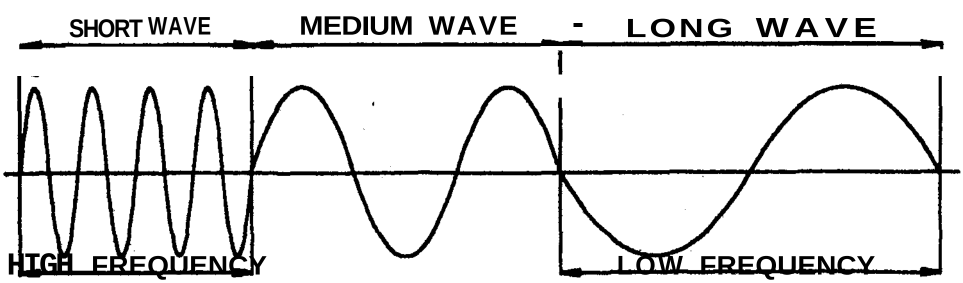
***For the beginner, what does this mean???***

The symbol Hz (pronounced Hertz, and named after a famous radio pioneer) represents one complete electromagnetic wave in a second. A kilohertz (kHz) is one thousand waves per second, and a Megahertz (MHz), a million waves in a second. The number of waves per second is called the Frequency.

**1 WAVE** IN **1** SECOND = 1 HERTZ




Often a reference is made to a stations wavelength rather than it's frequency. High frequency signals have short wavelengths and low frequency signals have long wavelengths. The frequency of a signal in kHz is given by dividing 300,000 by the wavelength in metres.



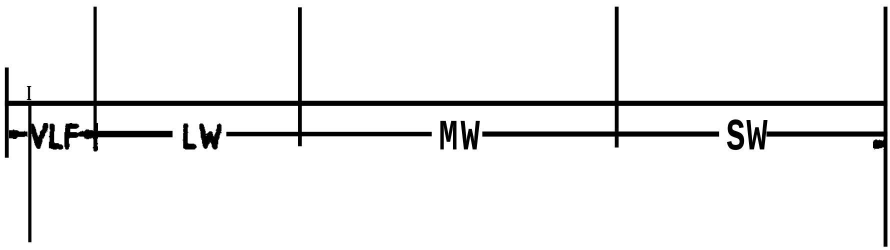

***Why are high frequency waves shorter than low frequency*** ???

Imagine that you could see a wave travelling past you at the speed of light. The wavelength would be the distance between two adjacent waves. If you increase the frequency of the waves then you would get more waves in the same space so the wavelength would be shorter.

Radio waves, light, X rays, are all electromagnetic waves. The only thing that differentiates them is their frequency.

For convenience the range of frequencies used for radio communications is split into bands. Frequencies below 100 kHz are called Very Low Frequencies (VLF). The Long Wave (LW) covers frequencies between 100 kHz and **300** kHz, whilst the Medium Wave (M W) covers the frequencies between 300 kHz and 1.6 MHz (1600 kHz).

All frequencies between 1.6 MHz and 30 MHz are referred to as Short Waves (S W).




The HF3 covers all of these bands in one continuous sweep with steps of 1 kHz. Numbers to the left of the decimal point are in MHt whilst those to the right are in kHz.

e.g. 0.198 is expressed as 198 kHz or 0.198 MHz

14.386 is expressed as 14386 kHz or 14.386 MHz

Turning the tuning knob slowly advances the tuning in 1 kHz steps, turning a little faster the steps change to 10 kHz, faster still the steps become 100 kHz, and a really fast spin will make the steps 1 MHz. This makes it quick and simple to hop from one end of the spectrum to the other.

# GETTING STARTED

The **HF3** is supplied with a simple long wire antenna connected to a phono plug. The wire length is 30 feet and is a good compromise for general coverage. **A** shorter wire will be less sensitive and, whilst a longer wire may pick up more of the desired signal, it may also pick up much more undesirable signals in the form of interference. The antenna wire should be strung up as high as possible and as far away from mains wiring, striplights, televisions, or any other source of interference (see Page 9). The shorter black wire from the phono plug is the ground terminal. Connect this to something that is well grounded. **A** cold water pipe or *mains earth is usually adequate. Do not connect to anything you are not certain is earthed.

***Do not attempt to connect directly to any Mains Supply without the aid of a qualified Electrician.***

Plug the 12 Volt line from the power supply into the receiver, plug in the antenna and set the attenuator on the rear of the receiver to it's normal position. You are now ready to go.

Switch on the receiver by rotating the volume control clockwise. The display will show the frequency and the mode. Set the mode to **AM.** To select mode USB, **AM** and **LSB** press MOD. This rosters through the modes. Set the Clarify control to it's central position. Adjust the volume to a convenient level and use the tuning knob to move up and down the spectrum and listen to the **AM** stations.

## To Store a Frequency In memory

Tune to the desired frequency and press MEM. The **S** meter then becomes the memory location pointer. Select the memory location using the tuning knob. When the desired location is selected press MEM, the desired frequency is stored in that location and the receiver returned to normal operation.

## To Recall a Frequency from memory

Press RCL. The S meter then becomes the memory location pointer. Select the desired memory location using the tuning knob. When the desired location is selected press RCL. The desired frequency is recalled and the receiver returned to normal operation.

The RST key resets the microprocessor and reverts to memory position 1.

Tune to 100 kHz and you will hear a fast ticking noise. These are the pulses of LORAN C, this is a long range navigation system in use all over the world. A little lower in frequency, between 80 and **90** kHz you can hear the carriers of the DECCA system. This system was set up in **1944** for the D day landing and has been in continuous maritime use ever since. Encrypted data is transmitted to military submarines at VLF. This covers very great distances. Speech is not transmitted.

The Medium and Long waves are crowded with domestic and foreign broadcast stations. When tuning a station rotate the tuning knob to obtain the highest number on the **Signal Strength Meter.**

Tune between 300 and **400** kHz for marine and aeronautical beacons. These are used by shipping and aircraft to get bearings. Each beacon transmits a Morse code ident of it’s name. The Morse is very slow and continually repeats, so if you don’t read Morse, you have plenty of time to look it up. The ident letters are often a syllable of the airport or towns name.

Domestic portable telephones operate at the high frequency end of the medium wave at about 1.6 MHz. At 1.8 MHz the short wave frequencies start. A quick flip round and you’ll find it’s very different than the medium wave band.

The BBC broadcasts it’s World Service on several short-wave frequencies. In times of crisis the BBC World Service has been the source of unbiased news the world over. Most countries have their own overseas broadcasts. Some follow in the traditions of the BBC, others simply use the airwaves for blatant propaganda.

Many overseas broadcast stations welcome contact with listeners. This helps them to establish their listener profite and assess their coverage. The station will usually repay the listener with give-away goodies and a QSL card (from the international Q code meaning “acknowledge receipt”). Many people make a hobby of collecting QSL cards from all over the world.

Some transmissions will not contain speech or music, they will just consist of warbling tones. These contain some form of data. It may be a weather chart broadcast to shipping, or a fax or telex to a news agency. Without a special decoder it cannot be read.

Another form of transmission found on short-wave is single side band (SSB).

To understand what this means it helps to see how it developed. In a conventional signal a carrier is transmitted. The amplitude (height of the wave) of the carrier is modulated with speech, hence the name “amplitude modulation” (AM). If the signal is studied carefully then the result of the modulation produces a carrier, an upper sideband of frequencies and a lower sideband of frequencies.

All this takes up space on the radio spectrum. Now, since the upper and lower sidebands are mirror images of each other it’s not necessary to transmit both, so one is filtered out in the transmitter. As no information is provided by the carrier that also can be filtered out leaving only one of the sidebands. This takes up less space in the spectrum and, because only wanted information is transmitted, makes better use of the power available.

This is single sideband or SSB. The downside of this is, firstly, the quality of reproduction is not usually as good as AM. For this reason it is only used for communications and not for broadcast. Secondly, it is more difficult to recover the original speech than in AM.

When recovering an SSB signal, the listener must know which sideband is being transmitted. Fortunately there is a convention. Frequencies below 10 MHz transmit the lower sideband (LSB), and those above 10 MHz use the upper sideband (USB). (There are exceptions to this convention, e.g. the R.A.F. VOLMET on 4717 kHz)

Tuning the Amateur band from 3500 to 3800 kHz you will always find SSB signals. With the receiver in the AM Mode the speech sounds severely distorted and, as there is no carrier the tuning meter rises and falls with the voice peaks. Switch to LSB, set the clarify control to it's centre position (pointer uppermost). Tune the receiver until the speech becomes as clear as possible, finally turn the clarify control until the speech seems as near normal as possible. Only a small adjustment of the clarify control will change the voice characteristic from high to low pitch. With a little patience, tuning in SSB stations becomes quite natural. Most people find it easier with the volume set at a low level.

When using the tuning knob to tune through a band of frequencies, place a finger in the dimple and turn the knob as if stirring a cup of tea. This will move gently in 1kHz steps. Holding the knob and twisting may accelerate it too fast and cause larger increment steps.

If a very strong station is encountered which causes overload and distortion then switch the attenuator to the **ATTEN** position. Remember to switch it back to normal for weaker stations. The HF3 has been designed to handle comparatively large signals at the antenna. A powerful local transmitter could still cause severe overload. This would usually manifest itself as that station breaking through all over the spectrum. In such cases a filter can be incorporated in line with the antenna plug, talk to your dealer for further details.

***When is the best time to listen*** ???

Early evening is usually a good time to listen with ever distant stations being received as the night progresses. Daylight conditions are less favourable. During a period of exceptional activity ("a lift"), the spectrum is crowded both day and night. Conditions can swing to the other extreme with only the more local stations available.

Over short distances, signals follow the contour of the earth (ground waves), however, long distance propagation relies on the signal bouncing off the ionosphere (sky waves). Often the skywave from a distant station is stronger than the groundwave from a local station. With experience the listener will soon learn the best time and conditions to receive the stations he wants.

## *What can I receive ???*

There are thousands of stations available on short wave when the conditions are right. Many will beam English programs into North America at certain times of the day. On an evening in August, English broadcasts were received from the following stations.

**All frequencies in kHz**

| | |
|---|---|
| Voice of Vietnam | 15009 & 9840 |
| Norwegian Radio | 7120 |
| Radio Kuwait | 11990 |
| BBC World Service | 6180,6195,9410,12095,15070 |
| Brazil Radio | 15265 |
| Radio Netherlands | 13700 |
| Voice of Russia | 11630&11677 |
| Radio Thailand | 7210 |
| Voice of Israel (Jerusalem) | 7465,9435,15615 |
| Voice of America | 9760 |
| Romania Radio | 11810 &11940 |
| RAI International (Italy) | 9670 |
| Radio Argentina | 15345 |
| Islamic Republic of Iran | 9022 |
| Polish Radio (Warsaw) | 7285 |
| China Radio International | 9920 |
| Christian Science Monitor | 13770 |

Radio Amateurs, from all over the world, were heard on the following bands:-

| | | |
|---|---|---|
| **160** Metre Band | **1800** to 2000 | (LSB) |
| **80** Metre Band | **3500** to **3800** | (LSB) |
| **40** Metre Band | **7000** to **7100** | (LSB) |
| 20 Metre Band | **1400** to **1435** | (USB) |

Dozens of other stations were received but not identified as their language was unfamiliar.

Most broadcasts beamed into Europe have programs in English, German and French, as these are the most commonly used languages. Few groups, however are left out.

From Bulgarian to Serbian, From Kinyarwanda to Swahili, if someone speaks it, then usually, someone broadcasts it.

For those interested in languages, the BBC broadcasts regular language courses. (Details on World Service broadcasts).

There are many Comprehensive guides available giving Frequencies and scheduled transmission times. Make sure that you get an up to date copy as schedules are often changed.

There are plenty of good books for the short-wave listener covering topics from antenna construction to eavesdropping on clandestine broadcasts.

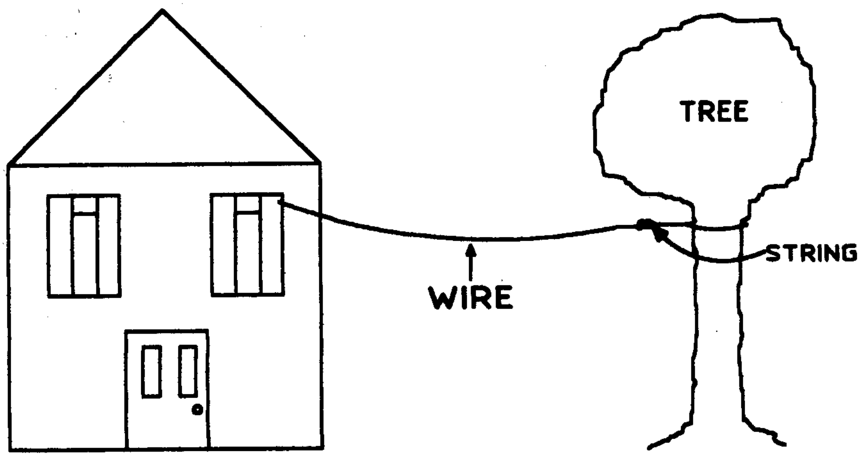
For the listener with an interest in Amateur Radio there are local radio clubs. Details are usually available from the local library or from the Radio Society of Great Britain.

**Note**

It is good practice to unplug the antenna when not in use. This will protect the receiver from damage during Electrical Storms.

It is also good practice to switch off the unit and unplug the Power Supply from the mains when the Receiver is not in use.

# ANTENNA




***Tie the end of the antenna wire to a piece of string which in turn is tied to a tall object.***

## IDEAL ANTENNA POSITION

If the antenna is to be some distance from the receiver, then use 70 ohm co-ax (TV Aerial cable) between the receiver and the antenna. If an outside antenna is not practical, then the antenna can be fitted as high as possible in the loft. Reasonable results can be obtained with an indoor antenna, though interference from other electrical equipment may cause problems. For serious listening a good antenna is worth the effort.

## Troubleshooting

- **o** UNIT WON'T TURN ON

  Check the power unit is plugged into the mains.

  Check the Power lead (DC) is plugged into the receiver and the receiver is switched on.

  If the unit is connected to an alternative power supply, check the voltage, polarity and fuse.

- **o** DISPLAY IS ON BUT UNIT WILL NOT RECEIVE

  Check antenna and ground connections.

- **o** THERE IS A HUM OR BUZZ PARTICULARLY ON STRONG LOCAL STATIONS

  Check ground connection. If necessary, try connecting to an alternative ground.

- **o** CAN RECEIVE LOCAL STATIONS BUT CANNOT RECEIVE DISTANT STATIONS

  Atmospheric conditions may be poor, wait until conditions improve. Check the antenna wire, re site the antenna if necessary.

- **o** HIGH LEVELS OF INTERFERENCE ARE EXPERIENCED

  Locate the source of interference if possible. Turn off all other items, especially **TV's,** computers etc. sequentially, until the offending item is found. Try to site the antenna as far from the source of interference as possible. Turn off items that cause problems. *I*

- **o** A LOCAL MEDIUM WAVE BROADCAST TRANSMITTER OVERLOADING THE RECEIVER CAUSING INTERFERENCE IN DIFFERENT PARTS OF THE SPECTRUM

  Switch in the attenuator. In extreme conditions a low cost tuneable notch filter is available, which plugs in series with the antenna.

- **o** A LOCAL VHF STATION BREAKS THROUGH

  A low cost low pass filter is available which plugs in series with the antenna.

- **FREQUENCY MOVES IN GREATER THAN 1 kHz STEPS WHEN FINE TUNING**

  Tuning knob is being turned too fast. Use the finger dimple in the tuning knob when fine tuning.

- **CANNOT PROPERLY RESOLVE SSB SIGNALS**

  Check that correct sideband is selected. Adjust the clarifier control for best sound. If there is insufficient adjustment on the clarifier control, return the clarifier to the central position and retune the main tuning knob.

- **SOME SIGNALS PARTICULARLY AROUND 27 MHz ARE DIFFICULT TO HEAR**

  That is because they are frequency modulated (FM). The receiver does not have an FM facility, however, tuning off the centre of the signal will allow these signals to be heard. This is commonly called “slope detection”.

- **DISPLAY SHOWS RANDOM CHARACTERS**

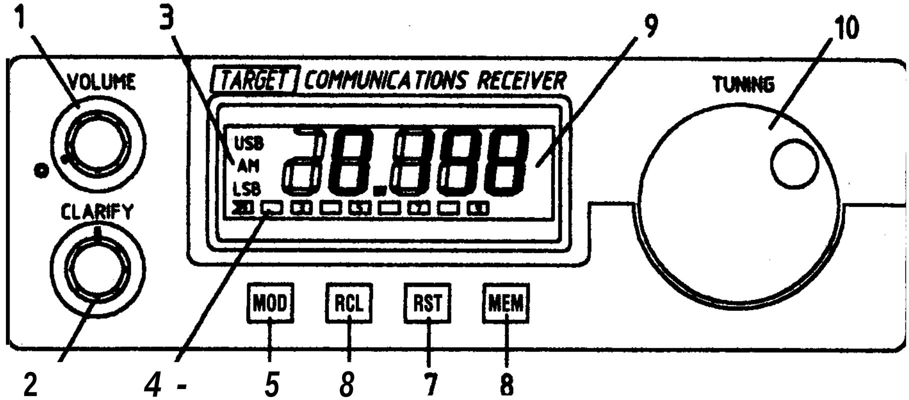
  A supply transient could upset the internal processor. If turning the tuning knob does not clear the problem then press RST. This performs a reset then returns to stored frequency display.

**NB.** The **HF3** receiver is optimised for speech communications. When listening to music, the audio response will be restricted.

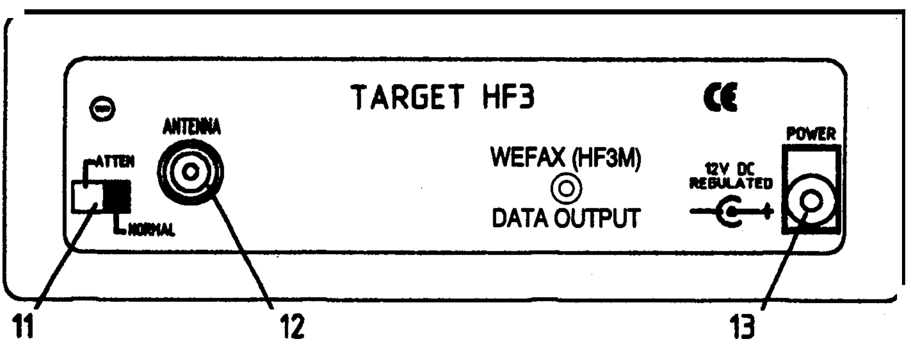
The **HF3** receiver has no facility for external audio output. The internal speaker is referenced to the positive rail. Any connection made to the speaker other than through a capacitor will damage the audio amplifier.

THIS UNIT IS PACKED WITH A **12** VOLT D.C POWER CABLE INCORPORATING A **1** AMP FUSE. CONNECT RED LEAD TO POSITIVE AND THE LEAD WITH THE BLACK STRIP TO NEGATIVE (SUPPLY REVERSAL WILL BLOW THE FUSE). CONNECT TO A **12** VOLT BATTERY **OR** A REGULATED D.C POWER SUPPLY. DO NOT EXCEED **13.8** VOLTS.

# FUNCTIONS




| | | |
|---|---|---|
| 1 | On/Off & Volume Control | Clockwise on. Continue for volume increase. |
| 2 | Clarify Control | Set at centre (blue mark up) tune either side of centre. |
| 3 | Mode Display USB AM LSB | Displays selected Mode only. |
| **4** | Signal Strength Meter | Bar Graph increases with received Signal Strength. |
| **5** | Rosters through Modes | Rosters LSB AM USB. |
| ***6*** | Recall from Memory | Recalls Freq. in Memory. |
| ***7*** | Reset | Reset and return to Memory Position 1 |
| **8** | Install into Memory | Installs Freq. displayed into Memory. |
| **9** | Frequency Display | MHz to left of Point.<br>kHz To right of Point. |
| 10 | Tuning Knob | Turn to alter Frequency. |
| 11 | Attenuator Switch | Set to Normal or Attenuate. |
| 12 | Antenna Socket | Plug Aerial in here. |
| 13 | Power Socket | Plug 12v Dc Supply here. |



# RECEIVING WEATHER FAX USING THE TARGET HF3/M

## MINIMUM REQUIREMENT OF PC

386 processor or better, minimum of 640k of RAM, 1.5MB free on hard disk, VGA monitor and spare COM port. (Must be COM 1 or 2)

## INSTALLING WE-FAX SOFTWARE ONTO HARD DISK

Ensure the computer is in Dos (not in a windows environment) and the C\: prompt displayed. Insert Disk and type **A : INSTALL** press RETURN (Note A represents the floppy drive letter) If the 3.5 Drive is B then type B **: INSTALL.** After installation the software will reside in directory **C:\ WEATHER** on the hard drive.) Remove the floppy disk.

## CONNECTING RECEIVER TO PC

Plug the data lead into the data socket at the rear of the receiver. Plug the 9 -pin connector into the spare serial port of the PC. (If the PC has a 25 pin serial port then a 9 to 25 pin adaptor is available at most computer stores.)

## SETTING UP RECEIVER

Connect antenna and ground as shown in the user guide. With the computer and its peripherals turned off tune the receiver to a local facsimile station.

For the UK the most useful stations are:-

| | | | | | |
|---|---|---|---|---|---|
| BRACKNELL | on | 4610, | 8040, | 14436 | KHZ |
| NORTHWOOD | on | 2374, | 3652, | 4307 | KHZ |
| OFFENBACH | on | 3855, | 7880, | 13882.5 | KHZ |

A full list of stations, frequencies, transmission times area coverage and chart symbols is available in the Admiralty list of radio signals volume three published by the hydrographer of the navy. See back page for stockists

## TUNING

Set the receiver to the exact frequency shown, ignore any figures after the decimal point. (there is no need for an offset.) Select **USB** and set the clarify control with the pointer centred. When no picture is being transmitted a constant note will be heard. During picture transmission this note will change to a rhythmic chirp. To get good quality pictures a good interference free signal is necessary. Atmospheric interference will usually sound like the hiss of frying **bacon** superimposed on the signal. ***Other interference*** such as that from TV and computers will usually be more of a rasping noise.

Each station has several frequencies, select the one which gives the best results. It will vary according to the time of day. Note: Not always the strongest station gives the best results. A weaker station may have less background noise and give a clearer picture.

Make sure you are satisfied with the quality of signal you're receiving on the computer. Ideally there should be no change in the quality of the signal being received. Many computers however (particularly models built before the introduction of regulations to limit emissions of radio interference) will emit radio interference which will degrade the signal.

To solve this problem it is necessary to locate the antenna as far from the computer as possible. Use a 70 ohm coaxial cable to connect the antenna to the receiver. It may also be helpful to locate the receiver some distance from the computer. If the interference is reduced by unplugging the data lead, the noise is being conducted along the shield of the cable. A data lead with an inline filter is available at most radio supply stores.

## RECEIVING PICTURES

With the computer in DOS and the C prompt displayed type **CD ** RETURN, **CD WEATHER** RETURN, **TARFAX** RETURN. (Note: **Also** the user may modify the auto exec. bat file to add the directory C :\ WEATHER to the default path, allowing the software to be run from anywhere). After selecting TARFAX software select either **F** for WEATHERFAX and refer to Wefax instructions or R for RTTY (Radioteletype) and refer to RTTY instructions.

## WEFAX (WEATHERFAX)

The menu page will be displayed. Press the **C** key. Select the serial port you are using - 1 or 2. (If you are not sure then try 1) followed by **ESC.** The zoom factor defaults to 1.2 and need not be adjusted. (Refer to section on zoom.)

Press the S key to move to the display screen. Press the **S** key again and printing will commence. If a picture is being transmitted it will start to write from the top of the screen. If no picture is being transmitted then a white background will start to print. **(If the picture remains totally black then the wrong com port is selected.)**

Pressing the S key will alternately start and stop the picture. Wait for a picture and start printing. Adjust the clarify control for best contrast, only a small movement is necessary. Turning clockwise will increase the pitch of the note from the receiver and make the picture lighter. Adjust until the background is peak white and the dark areas are black. As the picture builds up (and this can take several minutes) it may be split about its centre axis and may be slanted to one side. To correct the slant press the keys \ or / whilst a picture is printing to make the edges vertical. (Once this is set the result is stored and need not be altered.

You are now set to receive weather charts. Turn the volume control of the receiver to a convenient level to hear the signal.

At the beginning of a chart you will hear a loud buzzing noise, this is followed by a continuous blip - blip - blip -. This is a synchronising signal to get the edge of the chart aligned with the end of the screen.

Press S when the buzz is heard to start the picture. The blips will create a vertical line somewhere at the top of the screen. Using the ← or → key, move this line until it is off the screen either to the left or right. When the blips stop the chart will start to print. Press R to delete the blips and return the chart to the top of the screen. The volume can be turned down if necessary. (Its setting does not affect the chart.) At the end of the chart a buzz will be heard. Press the S key to end the recording. The chart can be viewed by pressing the page up or page down keys. Move the chart to the area you require. This chart can be saved in memory for future reference or to be manipulated or printed.

Press the Q key. A bar to the right of the screen indicates the data being copied to hard disk. The program returns to the main menu. Press the SPACE bar. Enter the name you want to give the chart followed by **.BMP (e.g. - WEFAX.BMP).** Press return and the map will be saved. To recover a map select the menu page. Press the R key and then the SPACE bar. Enter the name of the map followed by **.BMP** then press return.

The maps are stored as bitmap files and can be manipulated by any software which can handle bitmap files e.g. Paintbrush (Windows 3.1) or Paint (Windows 95).

## RTTY

Select **C** to set up the serial port and also select the Baud rate of the transmission. Command E is included to allow the invocation of an external text editor to view and manipulate received text. As a default it is assumed that a copy of the DOS editor (EDIT.COM) resides in the WEATHER directory. To change the default path simply edit the string in file EDIT.PTH in the WEATHER directory.

Press S to start reception. Tune the receiver to the desired station and press H. This will display a spectrum of the received signal. Tune the clarify control until two distinct peaks are received. (This corresponds to the upper and lower frequency tones of the signal). Using the → keys move the red line until it is central between the peaks. Press H again to return to the display page. (Some stations transmit in invert mode. To change the logic sense press key **I**).

Most marine stations transmit at 50baud, news agencies transmit on either 50 or 75 baud.

The German weatherservice in Hamburg transmit comprehensive weather forecasts on the following frequencies: 4583 khz, 7646 khz and 10101 khz.

## ADMIRALTY CHART AGENTS

The book "Admiralty list of radio signals volume three" which is a comprehensive guide to Radio weather services is available from:

Kelvin Hughes
145 Minories
London EC3 1NH
Tal: 0207 709 9076

Captain O.M. Watts
7 Dover Street
Piccadilly
London
Tel: 0207 493 4633